



minimal theory of mind
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What is it to have a theory of mind?

We do not fully understand

Theory of mind *abilities* are widespread

18-month-olds point to inform, and predict actions based on false beliefs

(Liszkowski et al 2006)

(Onishi & Baillargeon 2005; Southgate et al 2007)

Scrub-jays selectively re-cache their food in ways that deprive competitors of knowledge of its location

(Clayton, Dally & Emery 2007)

Chimpanzees conceal their approach from a competitor's view, and act in ways that are optimal given what another has seen

(Hare, Call & Tomasello 2006)

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Reasoning about beliefs

requires

(a) conceptual sophistication

- takes years to develop

- development tied to acquisition of executive function and language

- development facilitated by training and siblings

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(a) conceptual sophistication

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- development tied to acquisition of executive function and language

- development facilitated by training and siblings

(b) scarce cognitive resources

- attention

- working memory



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number

signature limits

What do infants, chimpanzees and scrub-jays represent that enable them, within limits, to track beliefs and other mental states?

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signature limits





Your *field* = a set of
objects related to you by
proximity, orientation,
lighting and other factors



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proximity



orientation



lighting



barriers



trajectory

Your *field* = a set of objects related to you by proximity, orientation, lighting and other factors

You *encounter* an object = it is in your field



proximity orientation lighting barriers trajectory

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Principle 1: one can't goal-directedly act on an object unless one has encountered it.



proximity orientation lighting barriers trajectory

Your *field* = a set of objects related to you by proximity, orientation, lighting and other factors

You *encounter* an object = it is in your field

You *register* an object at a location = you most recently encountered the object at that location

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proximity orientation lighting barriers trajectory

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Principle 2: correct registration is a condition of *successful* action.



proximity orientation lighting barriers trajectory

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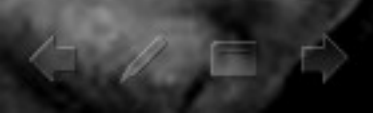
Principle 2: correct registration is a condition of *successful* action.

Principle 3: when an agent performs a goal-directed action and the goal specifies an object, the agent will act as if the object were actually in the location she registers it at.



proximity orientation lighting barriers trajectory

signature limits



1. Ayesha believes that Felix is in the Green Room

2. Felix is Frédérique

3. Ayesha believes that Frédérique is in the Green Room

(1) & (2) $\not\Rightarrow$ (3)

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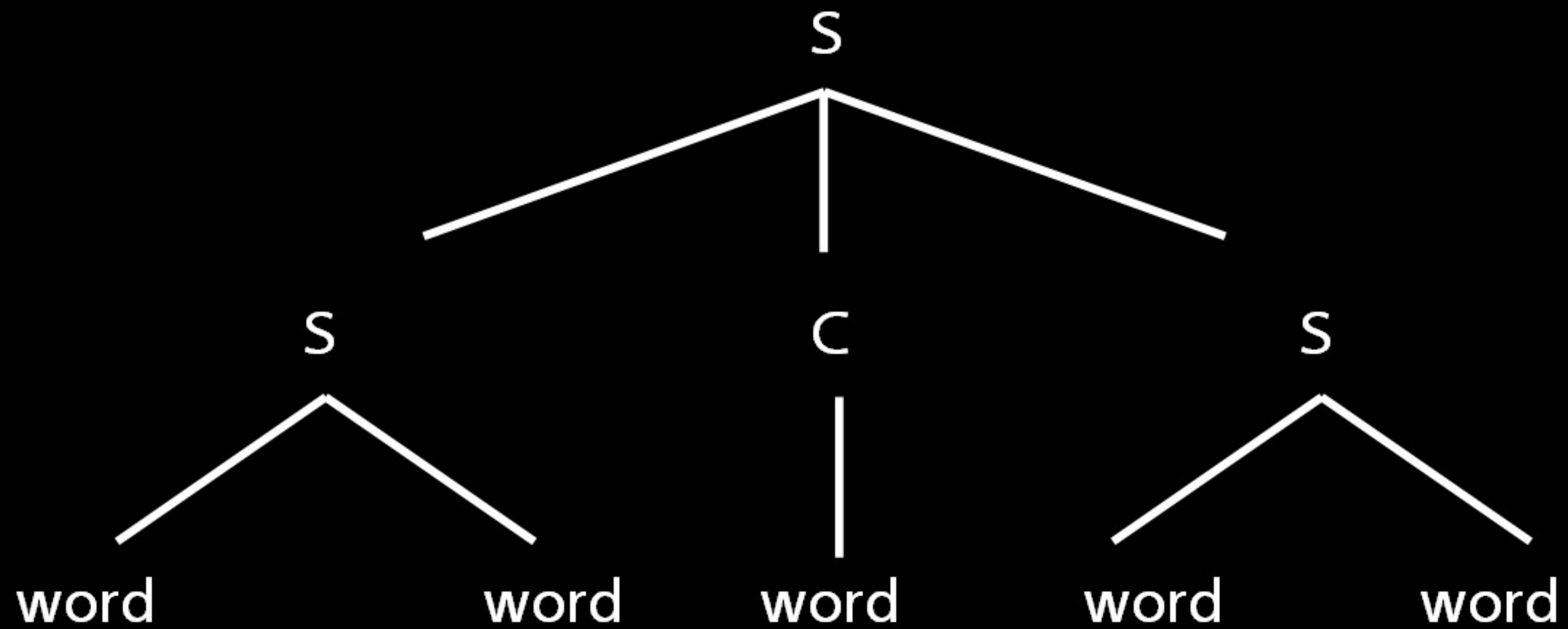
(1) & (2) $\not\Rightarrow$ (3)

4. Ayesha registers <Felix, Green Room>

5. Ayesha registers <Frédérique, Green Room>

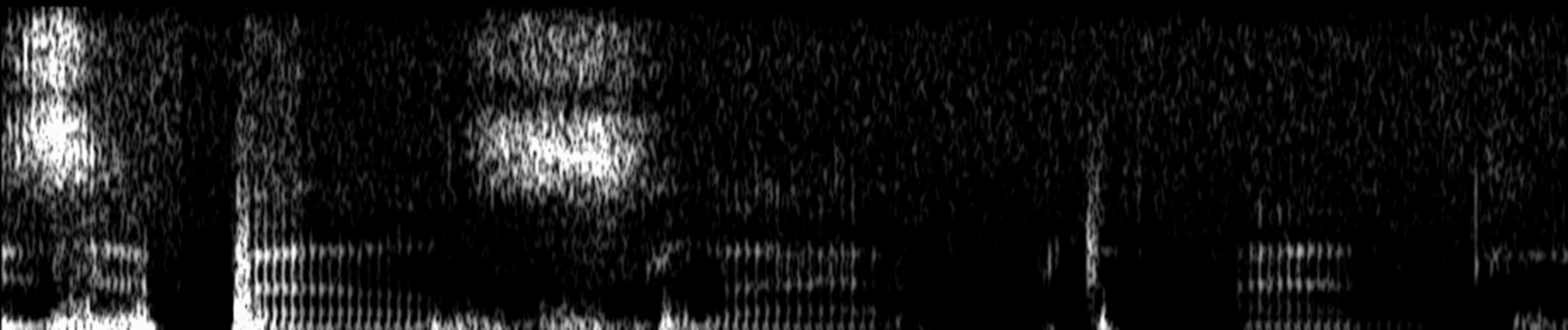
(4) & (2) \Rightarrow (5)

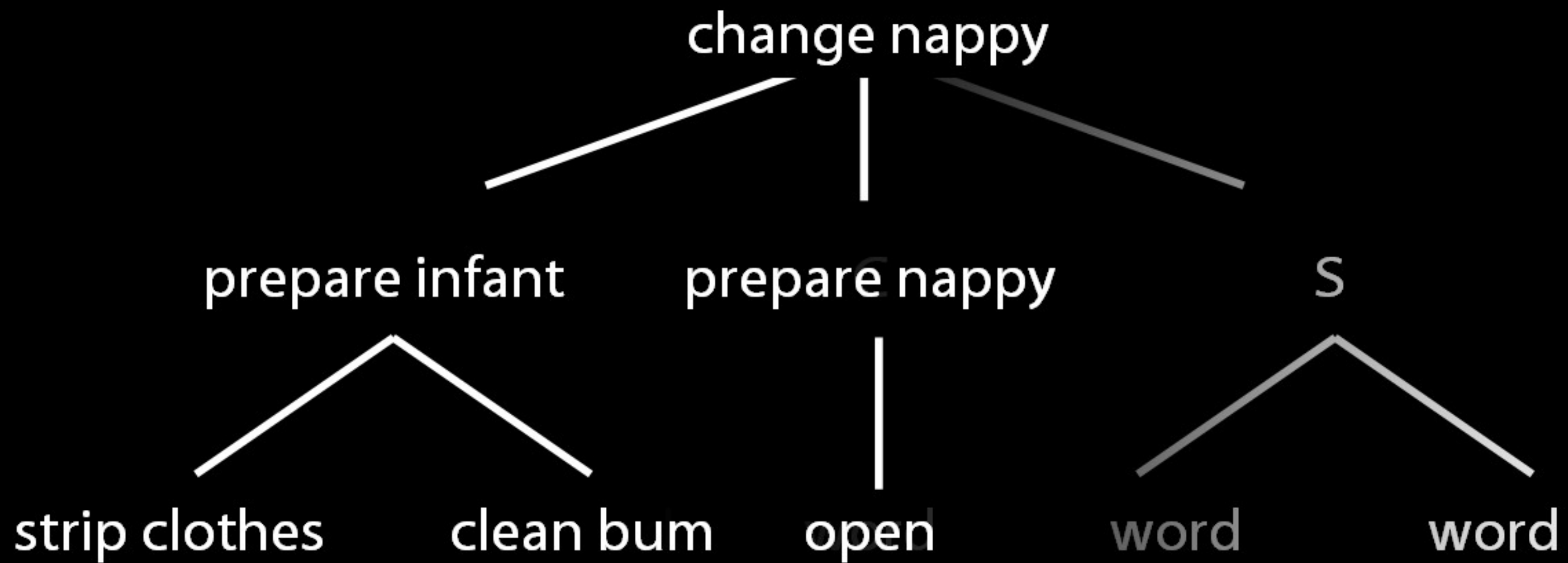




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^l i z ə b ɛ l ʃ l e p t ə n d l i l i k r a i d





... /reach X/ /grasp X/ /grasp Y/ /e//n//d//l//i//l//i//k//r//a//i//d/

... [reach-left-hand X] [left-whole] e n d l i l i k r a i d



plans

goals

motor action

motion

clauses

words

motor action

sound

change nappy

prepare infant

prepare nappy

S

strip clothes

clean bum

open

word

word

/reach X/ /grasp X/ /grasp Y/ /e//n//d//l//i//l//i//k//r//a//i//

[reach-left-hand X] [left-whole e n d l i l i k r a i d

